Framework-Date Extensions
and the
Management of Duck Harvests:
A Synopsis

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April 29, 2002

Introduction

The possibility of extending framework dates so that duck-hunting seasons can open earlier and remain open later has been the subject of extensive debate within the waterfowl management community. While potentially desirable from the perspective of hunting opportunity, extended framework dates could increase duck harvests substantially, cause shifts in the distribution of harvest toward more northerly and southerly States, and change duck reproductive behavior or physiology in adverse ways. Despite these uncertain impacts, interest in extended framework dates remains strong among most southern and some northern States. In response to this interest, the USFWS has proposed an opening date of the Saturday nearest September 24 and a closing date of the last Sunday in January, with no reductions in season length, in the "liberal" and "moderate" regulatory alternatives. The purpose of this synopsis is to briefly describe the conceptual model for accommodating framework-date extensions in adaptive harvest management (AHM) for mallards. More detailed information is available from the authors and from a report circulated to the Flyway Councils in February (*Johnson, F. A., J. A. Royle, and M. C. Runge, 2002, Framework-date extensions and the adaptive management of mallard harvest, U.S. Fish & Wildlife Service unpubl. rep.*). This synopsis also describes some of the anticipated impacts of extensions on mallards and other species.

Conceptual Model

Harvest rates of mallards realized under the current regulatory alternatives are predicted using harvest-rate estimates from 1979-84, which have been adjusted to reflect current season lengths and bag limits, as well as contemporary numbers of hunters. We propose to adopt standard Bayesian statistical methods for updating those regulation-specific predictions of harvest rates, including predictions of the effects of framework-date extensions. Essentially, the idea is to use existing information to develop initial harvest-rate predictions, to make regulatory decisions based on those predictions, and then to observe realized harvest rates. Those observed harvest rates, in turn, are treated as new sources of information for calculating updated predictions. Bayesian methods are attractive because they provide a quantitative and formal, yet intuitive, model with which to express an adaptive approach to management.

We begin by specifying the following model structure:

$$h_t \sim Normal\left(\mu + \Delta, \nu^2\right)$$

where h_t is the harvest rate realized under a particular regulatory alternative in any year t. These rates are assumed to be normally distributed with mean $\mu + \Delta$ and variance ν^2. In this statistical model, μ is the mean harvest rate expected in the absence of framework-date extensions, Δ is the marginal change in mean harvest

rate associated with extended framework dates, and v^2 is the amount of annual variability in harvest rate due to uncontrolled environmental factors and changes in hunter effort.

An assessment by the U.S. Fish & Wildlife Service (*USFWS, 2000, Framework-date extensions for duck hunting in the United States: projected impacts & coping with uncertainty, U.S. Dept. Interior, Washington, D.C. 8pp.*) suggests that implementation of framework-date extensions might be expected to increase harvest by 15% and 5% for midcontinent and eastern mallards, respectively. However, there is a great deal of uncertainty about the magnitude of the increases because of a lack of prior experience with nationwide extensions. Therefore, we intend to explicitly recognize this uncertainty (about Δ) in deriving optimal harvest strategies. The measure of uncertainty (variance of Δ) will be large enough to admit the possibility that extensions will result in *no* increase in mean harvest rates. If and when framework-date extensions are implemented, estimates of harvest rate derived from band-recovery data will be used to update the estimate of Δ (the marginal effect of extensions).

Anticipated Impacts on Mallards

The population models for midcontinent and eastern mallards recently were revised by the AHM Working Group to account for a positive bias in estimates of survival and reproductive rates. Evidence for this bias has been accumulating for a number of years and is currently estimated to be about +11% for midcontinent mallards and about +16% for eastern mallards (for more information see *USFWS, 2001, Adaptive harvest management: 2001 hunting season, U.S. Dept. Interior, Washington, D.C. 47pp.*). Model revisions to account for the bias tend to make optimal regulatory strategies more conservative than in the past, at least under some of the alternative models. We used the revised models to compare the expected performance of regulatory strategies with and without framework-date extensions (Table 1).

Table 1. Expected performance of optimal regulatory strategies for mallards, with and without framework extensions, using the revised (i.e., bias-corrected) models, the most recent model weights (from 2001), current harvest-management objectives, and predicted increases in harvest due to framework-date extensions of 15% and 5% for midcontinent and eastern mallards, respectively (BPOP = breeding population size; Harvest value = an index to annual harvest).

Population	Scenario	BPOP*		Harvest value*		Frequency of regulations (%)				
		$\bar{x}$	sd	$\bar{x}$	sd	C	VR	R	M	L
Midcontinent	no extensions	7.22	1.61	1.00	0.75	22.00	8.75	11.75	5.00	52.50
	extensions	7.07	1.56	1.02	0.86	29.50	11.00	8.75	12.50	38.25
Eastern	no extensions	0.905	0.163	0.455	0.119	0.0	0.0	0.0	0.0	100.0
	extensions	0.875	0.156	0.475	0.128	0.0	0.0	0.0	0.0	100.0

* in millions

Implementation of extensions is expected to result in lower average breeding-population sizes and higher average harvests because of the anticipated increases in mean harvest rate. However, we expect the frequency of the various regulatory alternatives to change only for those flyways basing regulations on midcontinent mallards (Pacific, Central, Mississippi), where the frequency of the liberal regulatory

alternative is expected to decline markedly with addition of the framework-date extension. In the Atlantic Flyway, where regulations are based on eastern mallards, we anticipate no change in the frequency of regulations with implementation of a framework-date extension.

Anticipated Impacts on Other Duck Species

The ability to predict changes in the harvest of other duck species that might occur as a result of framework-date extensions is limited. USFWS studies of the changes in harvest associated with an early opening date in Iowa and a late closing date in Mississippi suggest increases ($P < 0.1$) in the harvest of many species, including blue-winged teal, green-winged teal, wigeon, wood duck, scaup, and gadwall (*USFWS, 1999, Framework-date extensions for duck hunting in the United States: supplemental assessment, U.S. Dept. Interior, Washington, D.C. 8pp.*). In 1992, the USFWS reviewed the use of framework dates for managing duck harvests and concluded that hunting seasons opening prior to October 1 could be expected to increase the harvest of adult females, young-of-the-year, and locally reared ducks (*USFWS, 1992, A review of duck hunting framework dates, Office of Migratory Bird Management unpubl. rep, 49pp.*). There also has been much speculation that an extended closing date (i.e., beyond about January 20) might disrupt or delay formation of pair bonds, resulting in physiological stress that could manifest itself as reduced productivity during the subsequent breeding season. However, this issue is exceedingly difficult to study in the field and we are aware of no convincing evidence that extended closing dates would or would not have a major impact on subsequent reproductive success. Finally, we note that unlike mallards, there are no formal regulatory mechanisms in place for most other species that would automatically compensate for any observed increases in harvest.

"Evaluations" of Framework-Date Extensions

With respect to mallards, any inference about the causal relationship between framework-date extensions and Δ (the marginal change in mean harvest rate) will be very weak because changes due to extensions will be confounded with any other uncontrolled changes in harvest rates (i.e., there will be no experimental controls). Moreover, Δ can only be estimated reliably under the liberal regulatory alternative for midcontinent mallards, because estimates of realized harvest rate without extensions are not currently available for the other regulatory alternatives nor for eastern mallards. In these latter cases, it will be impossible to distinguish the marginal effect of extensions from errors in prior predictions of regulation-specific harvest rates. The potential for evaluation of framework-date extensions is no better with other duck species. As with mallards, it will be impossible to separate the effects of framework-date extensions from other uncontrolled factors should harvests increase in the future. Such inference is possible only with a sufficient number of areas that are randomly assigned as "controls" (i.e., are not offered the extension), but this may not be feasible given the strong interest in framework-date extensions expressed by most northern and southern states.